US005991518A

United States Patent [19]

Jardine et al.

[11] **Patent Number: 5,991,518**

[45] **Date of Patent: Nov. 23, 1999**

[54] **METHOD AND APPARATUS FOR SPLIT-BRAIN AVOIDANCE IN A MULTI-PROCESSOR SYSTEM**

[75] Inventors: **Robert L Jardine**, Cupertino; **Murali Basavaiah**, Sunnyvale; **Karoor S Krishnakumar**, East San Jose, all of Calif.

[73] Assignee: **Tandem Computers Incorporated**, Cupertino, Calif.

[21] Appl. No.: **08/790,269**

[22] Filed: **Jan. 28, 1997**

[51] **Int. Cl.**[6] **G06F 11/20**

[52] **U.S. Cl.** **395/182.02**

[58] **Field of Search** 395/182.02, 182.08, 395/182.09, 182.1, 182.21, 182.11, 183.11; 370/220, 216, 242, 247, 248

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,590,554	5/1986	Glazer et al.	395/200
4,868,818	9/1989	Madan et al.	395/182.02
4,879,716	11/1989	McNally et al.	395/182.02
4,939,752	7/1990	Literati et al.	395/182.02
5,367,697	11/1994	Barlow et al.	395/183.11
5,452,441	9/1995	Espsito et al.	395/182.11

OTHER PUBLICATIONS

PCT International Search Report for PCT/US98/01379 dated May 20,1998.

Primary Examiner—Robert W. Beausoliel, Jr.
Assistant Examiner—Pierre E. Elisca
Attorney, Agent, or Firm—Townsend and Townsend and Crew LLP

[57] **ABSTRACT**

A split brain avoidance protocol to determine the group of processors that will survive a complete partitioning (disconnection) in the inter-processor communications paths connecting processors in a multi-processor system. Processors embodying the invention detect that the set of processors with which they can communicate has changed. They then choose either to halt or to continue operations, guided by the goal of minimizing the possibility that multiple disconnected groups of processors continue to operate as independent systems, each group having determined (incorrectly) that the processors of the other groups have failed.

10 Claims, 18 Drawing Sheets